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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample and a personnel evaluation form are also included. (AG)

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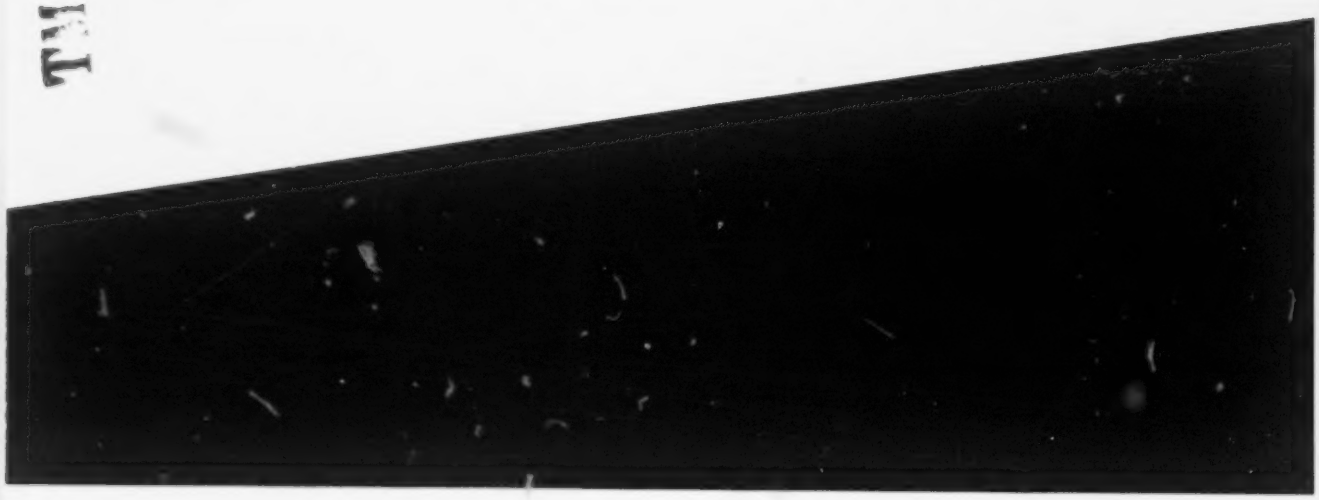
Development of USES Aptitude Test Battery for Coin-Vending-Machine Collector

(bus. ser.) 292.483



U.S. DEPARTMENT OF LABOR
MANPOWER ADMINISTRATION
BUREAU OF EMPLOYMENT SECURITY

Technical Report on Development of USES Aptitude Test Battery

For .....

Coin-Vending-Machine Collector
(bus. ser.) 292.483

S-397

U. S. Employment Service
in Cooperation with
Pennsylvania State Employment Service

July 1967

FOREWORD

The United States Employment Service General Aptitude Test Battery (GATB) was first published in 1947. Since that time the GATB has been included in a continuing program of research to validate the tests against success in many different occupations. Because of its extensive research base the GATB has come to be recognized as the best validated multiple aptitude test battery in existence for use in vocational guidance.

The GATB consists of 12 tests which measure 9 aptitudes: General Learning Ability, Verbal Aptitude, Numerical Aptitude, Spatial Aptitude, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, with a standard deviation of 20.

Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, in combination, predict job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the prediction of performance of the job duties of the experimental sample. It is important to recognize that another job might have the same job title but the job content might not be similar. The GATB norms described in this report are appropriate for use only for jobs with content similar to that shown in the job description included in this report.

Frank H. Cassell

Frank H. Cassell, Director
U. S. Employment Service

DEVELOPMENT OF USES APTITUDE TEST BATTERY

For

Coin-Vending- Machine Collector
(bus. ser.) 292.483-010

S-397

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Coin-Vending-Machine Collector (bus. ser.) 292.483-010. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB, B-1002 Scores
K - Motor Coordination	100
M - Manual Dexterity	85

RESEARCH SUMMARY

Sample:
57 male workers employed at the Macke Company in Philadelphia, Pennsylvania.

Criterion:
Supervisory ratings

Design:
Concurrent (test and criterion data were collected at approximately the same time).

Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, standard deviations, and selective efficiencies.

Concurrent Validity:
Phi Coefficient = .26 (P/2 less than .025)

Effectiveness of Norms:

Only 60% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the S-397 norms, 69% would have been good workers. 40% of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the S-397 norms only 31% would have been poor workers. The effectiveness of the norms is shown graphically in Table 1:

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	60%	69%
Poor Workers	40%	31%

SAMPLE DESCRIPTION

Size: N = 57

Occupational Status: Employed workers

Work Setting: Workers were employed at the Macke Company in Philadelphia, Pennsylvania.

Employer Selection Requirements:

Education: High school graduates preferred

Previous Experience: None

Tests: None

Other: Polygraph

Principal Activities: The job duties for each worker are comparable to those shown in the job description in the Appendix.

Minimum Experience: All workers in the sample had at least five months total job experience.

TABLE 2

Means, Standard Deviations Ranges and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience

	Mean	SD	Range	r
Age (years)	30.7	9.4	19-59	.212
Education (years)	11.4	1.3	7-14	.092
Experience (months)	38.2	40.2	5-160	.358**

**Significant at .01 level

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, Form B were administered during 1964, 1965, and 1966.

CRITERION

The criterion data consisted of supervisory ratings of job proficiency made at approximately the same time as test data were collected.

Rating Scale: A special rating scale of 16 items was devised. See Appendix.

Reliability: As there is a correlation of .91 between the overall item on the rating scale used (Item P) and the sum of the other fifteen items there appears to be satisfactory internal consistency reliability in the ratings.

Criterion Score Distribution:

Possible Range:	16-80
Actual Range:	28-73
Mean:	53.3
Standard Deviation:	10.0

Criterion Dichotomy: The criterion distribution was dichotomized into low and high groups by placing 40% of the sample in the low group to correspond with the percentage of workers considered unsatisfactory or marginal. Workers in the high criterion group were designated as "good workers" and those in the low group as "poor workers."

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout in the norms on the basis of a qualitative analysis of job duties involved and a statistical analysis of test and criterion data. Aptitudes P, K, and M which do not have a high correlation with the criterion were considered for inclusion in the norms because the qualitative analysis indicated that these aptitudes were important for the job duties and the sample had a relatively high mean score on these aptitudes. With employed workers a relatively high mean score may indicate that some sample pre-selection has taken place. Tables 3, 4 and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis
(Based on the job analysis the aptitudes listed appear to be important to the work performed)

Aptitude	Rationale
G - General Learning Ability	Must determine merchandise needed based on experience and product turnover.
N - Numerical Aptitude	Necessary in reconciling receipts and sales.
P - Form Perception	Necessary in stocking and cleaning vending machines.
Q - Clerical Perception	Necessary in record keeping and requisitioning.
K - Motor Coordination	Necessary in stocking and cleaning vending machines.
M - Manual Dexterity	Must carry and move merchandise, drive truck and load vending machines.

TABLE 4

Means, Standard Deviations, Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB; N = 57

Aptitudes	Mean	SD	Range	r
G - General Learning Ability	98.1	15.3	66-133	.058
V - Verbal Aptitude	96.1	13.3	72-133	.210
N - Numerical Aptitude	100.0	16.9	56-132	.118
S - Spatial Aptitude	99.6	16.6	65-130	-.157
P - Form Perception	104.2	16.6	67-153	.195
Q - Clerical Perception	102.5	15.0	57-155	.111
K - Motor Coordination	103.8	15.1	58-136	.088
F - Finger Dexterity	101.9	20.7	44-146	-.001
M - Manual Dexterity	104.7	19.5	31-139	-.009

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important	X		X		X	X	X		X
Irrelevant									
Relatively High Mean					X		X		X
Relatively Low Standard Dev.		X							
Significant Correlation with Criterion									
Aptitudes to be Considered for Trial Norms					P		K		M

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of a comparison of the degree to which trial norms consisting of various combinations of aptitudes P, K and M at trial cutting scores were able to differentiate between the 60% of the sample considered good workers and 40% of the sample considered poor workers. Trial cutting scores at five-point intervals approximately one standard deviation below the mean are tried because this will eliminate about one-third of the sample with three-aptitude norms. For two-aptitude trial norms, minimum cutting scores slightly higher than one standard deviation below the mean will eliminate about one-third of the sample; for four-aptitude trial norms, cutting scores slightly lower than one standard deviation below the mean will eliminate about one-third of the sample. The Phi Coefficient was used as a basis for comparing trial norms. The optimum differentiation for the occupation of Coin-Vending-Machine Collector 292.483-010 was provided by the norms of K-100 and M-85. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .26 (statistically significant at the .025 level).

TABLE 6

Concurrent Validity of Test Norms
P-95, K-100, M-85

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	9	25	34
Poor Workers	12	11	23
Total	21	36	57

Phi Coefficient = .26
Chi Square (X^2) = 3.9
Significance Level = P/2 less than .025

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study did not meet the requirements for incorporating the occupation studied into any of the 36 OAP's included in Section II of the Manual for the General Aptitude Test Battery. The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.

A-P-P-E-N-D-I-X

DESCRIPTIVE RATING SCALE

(For Aptitude Test Development Studies)

Score _____

RATING SCALE FOR _____
D. O. T. TITLE and CODE

Directions: Please read the sheet "Suggestions to Raters" and then fill in the items listed below. In making your ratings, only one box should be checked for each question.

Name of worker (print) _____
(last) (first)

Sex: Male _____ Female _____

Company Job Title: _____

How often do you see this worker in a work situation?

_____ See him at work all the time

_____ See him at work several times a day

_____ See him at work several times a week

_____ Seldom see him in work situation

How long have you worked with him?

_____ Less than one month

_____ one to two months

_____ Three to five months

_____ Six months or more

A. How much work can he get done? (Worker's ability to make efficient use of his time and to work at high speed.)

____ 1. Capable of very low work output. Can perform only at an unsatisfactory pace.

____ 2. Capable of low work output. Can perform at a slow pace.

____ 3. Capable of fair work output. Can perform at an acceptable but not a fast pace.

____ 4. Capable of high work output. Can perform at a fast pace.

____ 5. Capable of very high work output. Can perform at an unusually fast pace.

B. How good is the quality of his work? (Worker's ability to do high-grade work which meets quality standards.)

____ 1. Very poor. Does work of unsatisfactory grade. Performance is inferior and almost never meets minimum quality standards.

____ 2. Not too bad, but the grade of his work can stand improvement. Performance is usually acceptable but somewhat inferior in quality.

____ 3. Fair. The grade of his work is mediocre. Performance is acceptable but usually not superior in quality.

____ 4. Good, but the grade of his work is not outstanding. Performance is usually superior in quality.

____ 5. Very good. Does work of outstanding grade. Performance is almost always of the highest quality.

C. How accurate is he in his work, other than record keeping? (Worker's ability to avoid making mistakes.)

____ 1. Very inaccurate. Makes very many mistakes. Work needs constant checking.

____ 2. Inaccurate. Makes frequent mistakes. Work need more checking than is desirable.

____ 3. Fairly accurate. Makes mistakes occasionally. Work needs only normal checking.

____ 4. Accurate. Makes few mistakes. Work seldom needs checking.

____ 5. Highly accurate. Rarely makes a mistake. Work almost never needs checking.

D. How good is his ability to handle customer complaints and problems.

____ 1. Seriously lacking in judgment and tack; not at all able to handle complaints or problems.

____ 2. Frequently makes errors in answering questions or handling problems.

____ 3. Can generally handle problems; may occasionally need help in doing so.

____ 4. Usually handles problems with tact and diplomacy.

____ 5. Expertly handles questions, complaints, and problems with tact and diplomacy.

E. How well is he respected by his customers?

____ 1. Not at all well received by his customers.

____ 2. Not particularly liked by his customers.

____ 3. Generally, gets along satisfactorily with customers.

____ 4. Is well received by customers.

____ 5. Is very well received by customers.

F. How well does he handle the record keeping function?

____ 1. Paper work very poor; collection slips rarely prepared completely and legibly.

____ 2. Paper work poor -- collection slips prepared incomplete and illegibly.

____ 3. Paper work is generally acceptable although there are times when it is incomplete or illegible.

____ 4. Paper work very good; collection slips are rarely incomplete or illegible.

____ 5. Paper work is excellent; collection slips are always properly and legibly completed.

G. How well can the employee handle minor mechanical problems on route?

____ 1. Has very little mechanical knowledge and ability.

____ 2. Has poor mechanical knowledge and ability.

____ 3. Has average mechanical knowledge and ability.

____ 4. Has very good mechanical knowledge and ability.

____ 5. Has superior mechanical knowledge and ability.

H. How much ability to merchandise his products does the employee have?

____ 1. Is never conscious of rotating brands of merchandise to stimulate sales.

____ 2. Rarely bothers to ratate brands to stimulate sales.

____ 3. Usually rotate brands of merchandise to stimulate sales.

____ 4. Regularly rotates brands of merchandise with thought to brands that should be retained and those which are lagging and should be changed to stimulate sales.

____ 5. Always keeps sales at maximum by knowledge of which brands to rotate and when as well as which brands of merchandise to retain.

I. How much attention does he pay to the level of inventory in his respective units?

____ 1. Pays virtually no attention; inventory may be completely haphazard.

____ 2. His inventory level falls somewhat short of what it should be.

____ 3. His inventory level is generally adequate.

____ 4. His inventory level is usually better than that of most routemen.

____ 5. Does an exceptionally good job of maintaining the most desirable inventory level in each of his units.

J. How good is his driving skill and ability?

____ 1. Very poor under all circumstances and conditions.

____ 2. Not a good driver under most circumstances and conditions.

____ 3. Generally good under most circumstances and conditions.

____ 4. Very good under most circumstances and conditions.

____ 5. Excellent under all circumstances and conditions.

K. How clean is the equipment on his route?

____ 1. Always dirty.

____ 2. Frequently dirty.

____ 3. Generally clean but sometimes does not "get around" to cleaning some machines.

____ 4. Most machines clean almost all the time.

____ 5. Equipment always sparkling and in tip top condition.

L. How much aptitude or facility does he have for this kind of work? (Worker's adeptness or knack for performing his job easily and well.)

____ 1. Very low aptitude. Has great difficulty doing his job. Not at all suited to this kind of work.

____ 2. Low aptitude. Usually has some difficulty doing his job. Not too well suited to this kind of work.

____ 3. Moderate aptitude. Does his job without too much difficulty. Fairly well suited to this kind of work.

____ 4. High aptitude. Usually does his job without difficulty. Well suited to this kind of work.

____ 5. Very high aptitude. Does his job with great ease. Unusually well suited for this kind of work.

M. How large a variety of job duties can he perform efficiently? (Worker's ability to handle several different operations in his work.)

____ 1. A very limited variety. Cannot perform different operations adequately.

____ 2. A small variety. Can perform a few different operations efficiently.

____ 3. A moderate variety. Can perform some different operations with reasonable efficiency.

____ 4. A large variety. Can perform several different operations efficiently.

____ 5. An unusually large variety. Can do very many different operations efficiently.

N. How resourceful is he when something different comes up or something out of the ordinary occurs? (Worker's ability to apply what he already knows to a new situation.)

____ 1. Very unresourceful. Almost never is able to figure out what to do. Needs help on even minor problems.

____ 2. Unresourceful. Often has difficulty handling new situations. Needs help on all but simple problems.

____ 3. Fairly resourceful. Sometimes knows what to do, sometimes doesn't. Can deal with problems that are not too complex.

____ 4. Resourceful. Usually able to handle new situations. Needs help on only complex problems.

____ 5. Very resourceful. Practically always figures out what to do himself. Rarely needs help, even on complex problems.

O. How often does he make practical suggestions for doing things in better ways? (Worker's ability to improve work methods.)

____ 1. Never. Sticks strictly with the routine. Contributes nothing in the way of practical suggestions.

____ 2. Very seldom. Slow to see new ways to improve methods. Contributes few practical suggestions.

____ 3. Once in a while. Neither quick nor slow to see new ways to improve methods. Contributes some practical suggestions.

____ 4. Frequently. Quick to see new ways to improve methods. Contributes more than his share of practical suggestions.

____ 5. Very often. Extremely alert to see new ways to improve methods. Contributes an unusually large number of practical suggestions.

P. Considering all the factors already rated, and only these factors, how satisfactory is his work? (Worker's "all-around" ability to do his job.)

____ 1. Definitely unsatisfactory. Would be better off without him. Performance usually not acceptable.

____ 2. Not completely satisfactory. Of limited value to the organization. Performance somewhat inferior.

____ 3. Satisfactory. A fairly proficient worker. Performance generally acceptable.

____ 4. Good. A valuable worker. Performance usually superior.

____ 5. Outstanding. An unusually competent worker. Performance almost perfect

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FACT SHEET

Job Title: Coin Vending-Machine Collector (bus. ser.) 292.483-010

Job Summary: Fills vending machines with merchandise and collects money in machines. Determines merchandise needed and requisitions it. Turns in cash. Loads merchandise into truck; transports merchandise in truck to and from locations. Moves merchandise to machines; cleans machines. Maintains records. May deliver merchandise to snack bars or cafeterias. May make minor adjustments to machines when necessary.

Work Performed: Determines merchandise needed and requisitions it. Uses experience and product turnover to estimate amount of each product that will be needed. Determines when to restock same item and when to add or change items in order to achieve maximum sales. Completes requisition and turns it into supply manager or assistant. Pulls skid through storeroom and picks each item needed in supermarket fashion. Places items on skid. Marks on requisition form each item taken when order is filled. Pulls skid to check out counter where merchandise is checked against requisition.

1. Cigarette Machine

Unlocks machine with key and lifts off front of cigarette machine (weight about 30 lbs.). Counts packs of cigarettes already in machine to determine sales figure. Fills machine so that state tax stamp is visible and proper brand name is showing for each column of cigarettes. Loads packs of matches into machine. Empties coin box into money bag and replaces front of machine. Posts on route card the number of packs of cigaretts sold. Wipes machine with designated cleaning materials.

2. Candy Pastry, Pretzel, and Potato Chip Machines

Unlocks machine with key; opens it by swinging front of case on hinge. Counts number of empty shelves to determine sales figure. Places items on empty shelves; rotates merchandise by placing packages left in machine on bottom shelves to be sold first. Records in route book the merchandise that is sold. Removes cash box and empties it into money sack without counting. Wipes machine with designated cleaning materials. May fill or reduce to prescribed levels the columns of coins which make change.

3. Cold and Hot Drink Machines

Unlocks machine and opens it by using crank to spin bolt or by turning handle. Swings cup turret out; fills container with syrup if needs. Fills each column of cup turret. Cleans and wipes machine inside and out according to prescribed schedule. Checks safety cutoff float to see whether it is operating properly. Checks carbon dioxide gages to determine if it is necessary to change tank of gas. For coffee and hot drinks, flips switch to turn brewer off; turns on drain. Disconnects hot chocolate tube, swings chocolate canister and cup turret out, runs off remaining coffee in coffee pot. Washes coffee pot with

hot water to run off sediment; rinses brewer, cup chute and cup station in same fashion. Once each week sanitizes machine. Opens refrigerator unit, fill cream and liquid sugar containers. Fills chocolate container with chocolate mix and coffee container with fresh ground coffee. Empties drainage container and adds germicidal detergent. Takes reading of meter and enters of card; also enter number of cups, amount of coffee, sugar, cream, chocolate, and boullion placed in machine. Empties money from coin box into bag and checks change-making container. Fills container at side with cup lids. Tests vending machine with coins. Records on route card the number of cups used, number of gallons of syrup placed in machine and number of tests run.

4. Money Changer

Dollar bill changer - Unlocks machine removes magazine and places it in carrier case. Places full magazine in changer. Removes dollar bills from cash box and places in bag without counting. Locks machine and tests vend.

Quarter and half-dollar changes - Unlocks machine, and removes cabinet. Fills coin tubes to prescribed levels. Removes coins from cash box and dumps coins into bag. Counts coins on counting machine; counts paper money by denomination and wraps and labels by amount. Lists totals on appropriate form.

5. Transports Merchandise

Pulls loaded skid to truck at loading platform. Drives 3/4 to 1-1/2 ton truck with manual transmission. May use hand truck to load merchandise.

Effectiveness of Norms

Only 60% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the S-397 norms, 69% would have been good workers. 40% of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the S-397 norms only 31% would have been poor workers. The effectiveness of the norms is shown graphically in Table 1:

Applicability of S-397 Norms

The aptitude test battery is applicable to jobs which include a majority of duties described above.

GPO 930-004

DEPARTMENT OF LABOR
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